

## **CLEAN COPY OF THE CLAIMS**

### **1-2. (Cancelled)**

**3. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein the episode creation unit creates the plurality of episode data, based on previously stored episode data creation rules, by gathering the element data included in the life data accumulated by the life data accumulation unit.

**4. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein the episode analysis unit determines a structure of an associated use relationship by representing, as the frequent pattern tree, an appearance frequency and a combination pattern of the element data included in the plurality of episode data created by the episode creation unit, the frequent pattern tree associating, in each node, a type of the element data and a frequency which indicates the appearance frequency.

**5. (Previously Presented)** The device linkage control apparatus according to Claim 4, wherein the episode analysis unit includes:

a frequency derivation unit operable to calculate a frequency of each element data included in the plurality of episode data;

a sorting unit operable to rearrange the element data within each of the plurality of episode data, in a decreasing order of frequency; and

a frequent pattern tree generation unit operable to generate, with regard to the plurality of episode data, the frequent pattern tree by sequentially retrieving the element data, and placing the retrieved element data as new nodes in the frequent pattern tree, or incrementing the frequency of an existing node.

**6. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein the life pattern interpretation unit generates, as the life pattern information, information indicating a combination of devices corresponding to nodes that are in a parent-offspring relationship in the frequent pattern tree.

**7. (Previously Presented)** The device linkage control apparatus according to Claim 6, wherein the life pattern interpretation unit includes:

a node detection unit operable to detect a current node in the frequent pattern tree;

a parent node detection unit operable to detect all nodes that are parent nodes of the detected current node; and

a life pattern output unit operable to output, as the life pattern information, information indicating that a device corresponding to the detected parent node and a device corresponding to the current node are in an associated use relationship.

**8. (Cancelled)**

**9. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein the episode analysis unit includes:

a frequency derivation unit operable to calculate the frequency of each element data included in the plurality of episode data;

a sorting unit operable to rearrange the element data within the each of the plurality of episode data, in a decreasing order of frequency;

a frequent pattern tree generation unit operable to generate, with regard to the plurality of episode data, the frequent pattern tree by sequentially retrieving the element data, and placing the retrieved element data as new nodes in the frequent pattern tree, or incrementing the frequency of an existing node;

a subtree extraction unit operable to separate the generated frequent pattern tree into subtrees having, as new roots, nodes which are offspring of the root of the frequent pattern tree;

an episode re-creation unit operable to create episode data from the separated subtrees;

a reconstruction unit operable to reconstruct the subtrees by repeating, on the created episode data, the calculation by the frequency derivation unit, the rearrangement by the sorting unit, and the frequent pattern tree generation by the frequent pattern tree generation unit; and

a subtree combining unit operable to combine the reconstructed subtrees to the frequent pattern tree.

**10. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein the episode analysis unit includes:

an input episode data storage unit operable to store, as input episode data, the plurality of episode data created by the episode creation unit;

an input episode number determination unit operable to obtain a number of the input episode data stored in the input episode data storage unit;

a most-frequent element identification unit operable to identify the element data with the highest frequency from within each input episode data;

a most-frequent element extraction unit operable to extract the element data with the highest frequency from within each input episode data, and add the extracted element data to output episode data;

an output episode data storage unit operable to store the output episode data;

an input episode classification unit operable to classify the input episode data according to the type of the element data; and

a frequent pattern tree generation unit operable to generate the frequent pattern tree that associates, in respective nodes, the appearance frequency and combination pattern of the element data with the type of the element data and the frequency which indicates the appearance frequency, the element data being included in the output episode data stored in the output episode data storage unit.

**11. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein the episode creation unit creates element data indicating a device and the usage time of the device based on the life data, and creates, when the usage times of the element data have a fixed inclusive relationship or an overlapping relationship, episode data that includes the element data.

**12. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein the episode creation unit creates, based on the life data, event data indicating a device, an event occurring with the device, and an occurrence time of the event, and creates, when the occurrence times of the respective event data have a fixed inclusive relationship or an

overlapping relationship, episode data including element data corresponding to the devices indicated by the event data.

**13. (Previously Presented)** The device linkage control apparatus according to Claim 6, wherein the life pattern interpretation unit calculates, for each of the nodes that are in the parent-offspring relationship in the frequent pattern tree, a confidence level indicating a degree of an associated use relationship, and generates the life pattern information with only the nodes that are connected with a confidence level that is equal to or higher than a fixed value.

**14. (Previously Presented)** The device linkage control apparatus according to Claim 32, wherein, when a state of a first device indicated in the life pattern information is detected as changed, the control unit causes a state of a second device indicated in the life pattern information to change by controlling the second device.

**15. (Previously Presented)** The device linkage control apparatus according to Claim 14, wherein the first and the second device each include a timer, and when setting details of the timer included in the first device are detected as changed, the control unit changes setting details of the timer included in the second device.

**16. (Previously Presented)** The device linkage control apparatus according to Claim 15, wherein, when a setting of a preset time of the timer included in the first device is detected as changed, the control unit changes a setting of a preset time of the timer included in the second device in such a way that a difference between the times before changing and the times after changing is the same.

**17. (Previously Presented)** The device linkage control apparatus according to Claim 14, wherein, when the state of the first device indicated in the life pattern information is detected as changed, the control unit i) previously generates and records change information indicating that the state of the second device indicated in the life pattern information should be changed, and ii) causes the state of the second device to change by controlling the second device according to the change information after a predetermined time elapses.

**18. (Previously Presented)** The device linkage control apparatus according to Claim 17, wherein

the first and the second devices each include a timer, and

when setting details of the timer included in the first device are detected as changed, the control unit i) previously generates and records change information that includes an instruction to change the setting details of the timer included in the second device and a designation for a time for the change, and ii) changes the setting details of the timer included in the second device according to the change information at the time for the change.

**19. (Previously Presented)** The device linkage control apparatus according to Claim 14, wherein the control unit previously stores a plurality of linkage information identifying details of control and selection condition information indicating conditions for selecting one linkage information from among the plurality of linkage information, and when the state of the first device indicated in the life pattern information is detected as changed, the control unit selects one of the plurality of linkage information by referring to the selection condition information, and causes the state of the second device indicated in the life pattern information to change, by controlling the second device according to the selected linkage information.

**20. (Previously Presented)** The device linkage control apparatus according to Claim 19, wherein the first and the second devices each include a timer, the linkage information indicates a difference between preset times of timers included in the first and second devices,

the selection condition information indicates a correspondence of a setting value of the preset time of the timer included in the first device and the linkage information that is to be selected, and

when setting details of the preset time of the timer included in the first device are detected as changed, the control unit selects one linkage information corresponding to the changed preset time from among the plurality of linkage information by referring to the selection condition information, and changes the preset time of the timer included in the second device according to the selected linkage information.

**21. (Previously Presented)** The device linkage control apparatus according to Claim 14, wherein the first and the second devices each include a timer, and  
when setting details of the timer included in the first device are detected as cancelled, the control unit cancels the setting details of the timer included in the second device.

**22. (Previously Presented)** The device linkage control apparatus according to Claim 14, wherein the first and the second devices each include a timer, and  
when setting details of the timer included in the first device are detected as changed, the control unit causes the second device to make a sound output or a display output by controlling the second device, the output indicating that the setting details are changed.

**23-31. (Cancelled)**

**32. (Previously Presented)** A device linkage control apparatus which identifies a frequency of associated use between devices among a plurality of devices, and controls, in linkage with each other, a set of the devices having a high frequency for being used in association with each other, the apparatus comprising:

a life data accumulation unit operable to accumulate life data indicating a usage history of the plurality of devices;

an episode creation unit operable to create, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

an episode analysis unit operable to create, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which the device sets are used in association with each other;

a life pattern interpretation unit operable to identify, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other; and

a control unit operable to control, in linkage with each other, the device sets having a high frequency for being used in association with each other,

wherein, with regard to subtrees having nodes of the frequent pattern tree as roots, the episode analysis unit constructs the frequent pattern tree with a structure in which element data having a highest frequency becomes a root of a subtree,

the life pattern interpretation unit identifies, based on the frequent pattern tree, a device A and a device B, which have a high frequency for being used in association with each other, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices, and

the control unit controls, in linkage with each other, at least device A and device B, and wherein the episode analysis unit (i) creates new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes, (ii) recursively performs the subtree extraction and the episode creation on the created episodes until there are no more subtrees, and (iii) reconstructs the frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**33. (Previously Presented)** A device linkage control method, for use in a device linkage control apparatus, for identifying a frequency of associated use between devices among a plurality of devices, and controlling, in linkage with each other, a set of the devices having a high frequency for being used in association with each other, the method comprising:

accumulating life data indicating a usage history of the plurality of devices;

creating, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

creating, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other;

identifying, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other;

controlling, in linkage with each other, the device sets having a high frequency for being used in association with each other, wherein

said accumulating life data operation, said creating a plurality of episode data operation, said creating the frequent pattern tree operation, said identifying operation, and said controlling operation are executed by the device linkage control apparatus,

with regard to subtrees having respective nodes of the frequent pattern tree as roots, the frequent pattern tree is constructed, in said creating a frequent pattern tree operation, with a structure in which element data having a highest frequency becomes a root of a subtree,

in said identifying operation, a device A and a device B which have a high frequency for being used in association with each other are identified, based on the frequent pattern tree, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices, and

in said controlling operation, at least device A and device B are controlled in linkage with each other; and

creating new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes;

performing, recursively, the subtree extraction and said creating new episode operation on the created new episodes until there are no more subtrees; and

reconstructing the frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**34. (Previously Presented)** A program, for use in a device linkage control apparatus, for identifying a frequency of associated use between devices among a plurality of devices, and controlling, in linkage with each other, a set of the devices having a high frequency for being used in association with each other, the program being held in a storage unit of the device linkage control apparatus, and causing a CPU which controls operation of the device linkage control apparatus to execute at least the following:



accumulating life data indicating a usage history of the plurality of devices;

creating, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

creating, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other;

identifying, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other;

controlling, in linkage with each other, the device sets having a high frequency for being used in association with each other, wherein

with regard to subtrees having respective nodes of the frequent pattern tree as roots, the frequent pattern tree is constructed, in said creating a frequent pattern tree operation, with a structure in which element data having a highest frequency becomes a root of a subtree,

in said identifying operation, a device A and a device B which have a high frequency for being used in association with each other are identified, based on the frequent pattern tree, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices, and

in said controlling operation, at least device A and device B are controlled in linkage with each other; and

creating new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes;

performing, recursively, the subtree extraction and said creating new episode operation on the created new episodes until there are no more subtrees; and

reconstructing the frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**35. (Previously Presented)** A device linkage control system comprising a plurality of devices and a control apparatus that are connected to each other by a transmission line, the control apparatus controlling the plurality of devices in linkage with each other,

wherein the control apparatus includes:

a life data accumulation unit operable to accumulate life data indicating a usage history of the plurality of devices;

an episode creation unit operable to create, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

an episode analysis unit operable to create, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other;

a life pattern interpretation unit operable to identify, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other; and

a control unit operable to control, in linkage with each other, the device sets having a high frequency for being used in association with each other,

wherein, with regard to subtrees having nodes of the frequent pattern tree as roots, the episode analysis unit constructs the frequent pattern tree with a structure in which element data having a highest frequency becomes a root of a subtree,

the life pattern interpretation unit identifies, based on the frequent pattern tree, a device A and a device B, which have a high frequency for being used in association with each other, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices, and

the control unit controls, in linkage with each other, at least device A and device B, and wherein the episode analysis unit (i) creates new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes, (ii) recursively performs the subtree extraction and the episode creation on the created episodes until there are no more subtrees, and (iii) reconstructs the

frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**36. (Previously Presented)** A life pattern information generating apparatus that generates life pattern information for a device linkage control apparatus that controls a plurality of devices in linkage with each other based on the life pattern information, the life pattern information generating apparatus comprising:

- a life data accumulation unit operable to accumulate life data indicating a usage history of the plurality of devices;

- an episode creation unit operable to create, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

- an episode analysis unit operable to create, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other; and

- a life pattern interpretation unit operable to identify, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other,

- wherein, with regard to subtrees having nodes of the frequent pattern tree as roots, the episode analysis unit constructs the frequent pattern tree with a structure in which element data having a highest frequency becomes a root of a subtree, and

- the life pattern interpretation unit identifies, based on the frequent pattern tree, a device A and a device B, which have a high frequency for being used in association with each other, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices, and

- wherein the episode analysis unit (i) creates new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes, (ii) recursively performs the subtree extraction and the episode creation on the created episodes until there are no more subtrees, and (iii) reconstructs the

frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**37. (Previously Presented)** A life pattern information generation method for generating, using a life pattern information generation apparatus, life pattern information for a device linkage control apparatus that controls a plurality of devices in linkage with each other based on the life pattern information, the method comprising:

accumulating life data indicating a usage history of the plurality of devices;

creating, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

creating, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other;

identifying, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other,

wherein said accumulating life data operation, said creating a plurality of episode data operation, said creating the frequent pattern tree operation, and said identifying operation are executed by the life pattern information generation apparatus,

with regard to subtrees having respective nodes of the frequent pattern tree as roots, the frequent pattern tree is constructed, in said creating a frequent pattern tree operation, with a structure in which element data having a highest frequency becomes a root of a subtree, and

in said identifying operation, a device A and a device B which have a high frequency for being used in association with each other are identified, based on the frequent pattern tree, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices;

creating new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes;

performing, recursively, the subtree extraction and said creating new episode operation on the created new episodes until there are no more subtrees; and

reconstructing the frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**38. (Previously Presented)** A program for generating, using a life pattern information generation apparatus, life pattern information for a device linkage control apparatus that controls a plurality of devices in linkage with each other based on the life information, the program being held in a storage unit of the life pattern information generation apparatus, and causing a CPU controlling operation of the life pattern information generation apparatus to execute at least the following:

accumulating life data indicating a usage history of the plurality of devices;

creating, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

creating, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other;

identifying, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other, wherein

with regard to subtrees having respective nodes of the frequent pattern tree as roots, the frequent pattern tree is constructed, in said creating a frequent pattern tree operation, with a structure in which element data having a highest frequency becomes a root of a subtree, and

in said identifying operation, a device A and a device B which have a high frequency for being used in association with each other are identified, based on the frequent pattern tree, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices;

creating new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes;

performing, recursively, the subtree extraction and said creating new episode operation on the created new episodes until there are no more subtrees; and

reconstructing the frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**39. (Previously Presented)** A device linkage control apparatus that controls a plurality of devices in linkage with one another, which is used by being connected to a life data accumulating apparatus that accumulates life data indicating usage of the plurality of devices in daily life of a user, the device linkage control apparatus comprising:

a life data accumulation unit operable to accumulate life data indicating a usage history of the plurality of devices;

an episode creation unit operable to create, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

an episode analysis unit operable to create, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other;

a life pattern interpretation unit operable to identify, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other; and

a control unit operable to control, in linkage with each other, the device sets having a high frequency for being used in association with each other,

wherein, with regard to subtrees having nodes of the frequent pattern tree as roots, the episode analysis unit constructs the frequent pattern tree with a structure in which element data having a highest frequency becomes a root of a subtree,

the life pattern interpretation unit identifies, based on the frequent pattern tree, a device A and a device B, which have a high frequency for being used in association with each other, as a combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices, and

the control unit controls, in linkage with each other, at least device A and device B, and

wherein the episode analysis unit (i) creates new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes, (ii) recursively performs the subtree extraction and the episode creation on the created episodes until there are no more subtrees, and (iii) reconstructs the frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**40. (Previously Presented)** A life pattern information generating apparatus that generates life pattern information for a device linkage control apparatus controlling a plurality of devices in linkage with each other based on the life pattern information, the life pattern information generating apparatus being used by being connected to a life data accumulating apparatus that accumulates life data indicating usage of a plurality of devices in daily life of a user, and comprises:

a life data accumulation unit operable to accumulate life data indicating a usage history of the plurality of devices;

an episode creation unit operable to create, from the life data, a plurality of episode data, based on episode data creation rules which determine devices that have been used in association with each other, the plurality of episode data having, as data, a plurality of the devices that have been used in association with each other;

an episode analysis unit operable to create, from the plurality of episode data, a frequent pattern tree representing, as a tree structure, a frequency at which device sets are used in association with each other; and

a life pattern interpretation unit operable to identify, according to the frequent pattern tree, a combination of device sets as life pattern information, the device sets having a high frequency for being used in association with each other,

wherein, with regard to subtrees having nodes of the frequent pattern tree as roots, the episode analysis unit constructs the frequent pattern tree with a structure in which element data having a highest frequency becomes a root of a subtree, and

the life pattern interpretation unit identifies, based on the frequent pattern tree, a device A and a device B, which have a high frequency for being used in association with each other, as a

combination having a high association frequency, even when each of device A and device B are combined and used in association with other devices, and

wherein the episode analysis unit (i) creates new episodes by extracting subtrees having, as new roots, nodes which are offspring of a node equivalent to a root of the frequent pattern tree, tracking nodes within each of the extracted subtrees starting from the root, and combining element data stored in the nodes, (ii) recursively performs the subtree extraction and the episode creation on the created episodes until there are no more subtrees, and (iii) reconstructs the frequent pattern tree by integrating recursively constructed subtree frequent pattern trees, into positions in the frequent pattern tree.

**41. (Previously Presented)** The device linkage control apparatus according to claim 32, wherein each of the nodes of the frequent pattern tree correspond to a different one of the devices that are to be controlled,

the life pattern interpretation unit identifies information indicating two or more of the different devices as the life pattern information, and

the control unit controls the two or more different devices indicated by the life pattern information that are in linkage with each other.